CLAIMS

We claim:

1. A process for making a composite structural member, comprising:

providing a preform of a composite material with a reinforcement material in a polymer matrix;

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix; and

cooling the composite material to form a composite structural member.

2. The process of claim 1, wherein the reinforcement material comprises electrically-conductive fibers.

3. The process of claim 1, wherein the polymer matrix comprises a thermoplastic polymer.

4. The process of claim 1, including regulating the current and the voltage.

5. The process of claim 4, including maintaining the voltage within the range of about 2 to about 250 Volts

6. The process of claim 4, including maintaining the current within the range of about 10 microamperes to about 100 amperes.

7. The process of claim 1, including maintaining the current and voltage for about 1 second to about 3 minutes.

8. The method of claim 1, further including compressing the composite material while flowing the electrical current and while cooling.

9. A process for making a composite structural member, comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix;

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix; and

cooling the composite material to form a composite structural member.

10. A process for making a composite structural member, comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix;

flowing an electrical current of about 10 microamperes to about 100 amperes with a voltage of about 2 to about 250 volts across the preform to substantially melt the polymer matrix; and

cooling the composite material to form a composite structural member.

11. A composite structural member made by the method comprising:

providing a preform of a composite material with a reinforcement material in a polymer matrix;

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix; and

cooling the composite material to form a composite structural member.

12. A composite structural member made by the method comprising:

providing a preform of a composite material comprising conductive fibers in a

thermoplastic polymer matrix;

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix; and

cooling the composite material to form a composite structural member.

13. A composite structural member made by the method comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix;

flowing an electrical current of about 10 microamperes to about 100 amperes with a voltage of about 2 to about 250 volts across the preform to substantially melt the polymer matrix; and

cooling the composite material to form a composite structural member.

14. A process for heating a composite material, comprising:

providing a preform of a composite material with a reinforcement material in a polymer matrix; and

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix.

15. The process of claim 14, wherein the reinforcement material comprises electrically-conductive fibers.

16. The process of claim 14, wherein the polymer matrix comprises a thermoplastic polymer.

17. The process of claim 14, including regulating the current and the voltage.

18. The process of claim 17, including maintaining the voltage within the range of about 2 to about 250 volts.

19. The process of claim 17, including maintaining the current within the range of about 10 microampers to about 100 amperes.

20. The process of claim 14, including maintaining the current and voltage for about 1 second to about 3 minutes.

21. The method of claim 14, further including compressing the composite material while flowing the electrical current.

22. A process for heating a composite material, comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix; and

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix.

23. A process for heating a composite material, comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix; and

flowing an electrical current of about 10 microamperes to about 100 amperes with a voltage of about 2 to about 250 volts across the preform to substantially melt the polymer matrix.

24. A composite structure made by the method comprising:

providing a preform of a composite material with a reinforcement material in a polymer matrix; and

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix.

25. A composite structure made by the method comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix; and

flowing an electrical current with a voltage across the preform to substantially melt the polymer matrix.

26. A composite structure made by the method comprising:

providing a preform of a composite material comprising conductive fibers in a thermoplastic polymer matrix; and

flowing an electrical current of about 10 microamperes to about 100 amperes with a voltage of about 2 to about 250 volts across the preform to substantially melt the polymer matrix.

27. An apparatus for heating a composite structure, comprising

means for supply an electrical current with a voltage;

means for controlling the electrical current;

means for controlling the voltage; and

means for flowing the current across a composite structure.

28. The apparatus of claim 27, wherein the supplying means comprises a battery.

29. The apparatus of claim 27, wherein the current controlling means comprises an analog or digital current controller.

30. The apparatus of claim 27, wherein the voltage controlling means comprises an

analog or digital voltage controller.

31. The apparatus of claim 27, wherein the current controlling means and the voltage controlling means are combined in a single device.

32. The apparatus of claim 27, wherein the flowing means includes an electrical conducting means and an electrical connecting means.

33. The apparatus of claim 32, wherein the electrical conducting means comprises electrical wiring.

34. A system for making a composite structure, comprising:

an apparatus for heating a composite material, comprising means for supply an electrical current with a voltage, means for controlling the electrical current, means for controlling the voltage, and means for flowing the current across a composite structure; and

means for compressing the composite material.